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REVIEWS

Maryland Geological Survey, Miocene. By WILLIAM BULLOCK CLARK, State Geologist, 1904. 2 vols. (1) Text pp. 1-543 and Plates I-IX; (2) text pp. 1-127 and Plates X-CXXXV.

This volume is an admirable example of the results to be attained by the co-operation of numerous experts organized to elaborate the various aspects of a single problem in geology. Much separate and individual work had already been done on the Miocene deposits of Maryland when this survey began. Under the leadership of Dr. Clark, new collections and new surveys were made, and with the literature and old collections at hand, and by an exhaustive study of the Miocene, its stratigraphy and its faunas, with refiguring of old forms and descriptions of new, a concise but exhaustive monograph of the Maryland Miocene has been produced, interesting to any intelligent reader.

The introductory part is contributed by Dr. Clark. Dr. G. B. Shattuck, who, assisted by other members of the survey, has personally conducted the stratigraphic study in the field, writes the geological part and the discussion of early literature. In this portion is found an exhaustive list of species with their local distribution in eighty-eight separate stations, and general distribution into the five zones into which the Miocene is divided (viz., Calvert, zone 17 [lower bed], and zone 19 [upper bed] of the Choptank [as a whole] and the St. Mary's formations).

Dr. W. H. Dall writes the chapter on the relations of the Miocene of Maryland to that of other regions and to the recent formations. Dr. Dall supplies at the end of this part a valuable list of the species characteristic of the North American Miocene, by which he means "the species which occur only in the Miocene and occur in it from top to bottom . . . not at every horizon . . . they have existed throughout the Miocene somewhere, and disappear with the inauguration of the Pliocene" (see p. cliii).

The "Systematic Paleontology" is written by different authors, each taking the group of fossils to which he has given special study. Dr. E. C. Case, Dr. C. R. Eastman, E. O. Ulrich, R. S. Bassler, T. W. Vaughan, Dr. R. M. Bagg, Jr., Dr. Arthur Hollick, Mr. C. S. Boyer, Dr. G. C. Martin, Dr. L. C. Glenn, and Dr. W. B. Clark, each discuss one or more groups of either animals or plants.

A comparison of the Miocene of America with that of Europe suggests to Dr. Dall the following:

The differentiation of faunas was well established before the beginning of the Tertiary, and Eocene faunas in America show American characteristics clearly, as compared with those of Europe. Other differences, suggesting migrations, occur in the relative time of appearance of certain groups; as, for instance, in America, the first influx of Nummulites is in the upper beds of the lower Oligocene, just as they were about to disappear from the European fauna, where they had flourished in myriads at an earlier epoch, though then unknown west of the Atlantic. Thus we may expect and shall find, on an inspection of the American Miocene, both differences and points of agreement. As in Europe, so in America, the Miocene was a period of elevation of plication of the earth's crust with its attendant vulcanism, of denudation of the recently elevated areas, and the formation of extended areas of sediment, formed chiefly of clays, sands, and marls, either consolidated into shales and sandstones, or remaining less compacted. The elevation of middle America and the Antillean region, in harmony with that of southern Europe, seems to have been more or less constant, since no marine Miocene beds have been definitely recognized in this area, and the antecedent Oligocene sediments were elevated several thousand feet, North and South America were united, the island of Florida became attached to the Georgian mainland, and the continent of North America on the whole assumed approximately its present outlines. Some modification of the coast line or sea bottom, supposedly in the vicinity of the Carolinas or possibly connected with the elevation of the Antilles, diverted the warm currents corresponding to the present Gulf Stream so far off-shore in the early part of the Miocene as to permit of the invasion of the southern coast lines by a current of cold water from the north, bringing with it its appropriate fauna and driving southward or exterminating the pre-existent subtropical marine fauna of these shores. This resulted in the most marked faunal change which is revealed by the fossil faunas of the Atlantic coast of America subsequent to the Cretaceous. A cool-temperate fauna for the time replaced the subtropical one normal to these latitudes, and has left its traces on the margin of the continent from Martha's Vineyard Island in Massachusetts south to Fort Worth inlet in east Florida, and westward to the border of the then existing Mississippi embayment.

The deep embayment of the Chesapeake region in Maryland and Virginia has retained the largest and least-disturbed area of the marine Miocene sediments and given its name to them, as typical, on the Atlantic coast, of the faunal remains of this character, which they contain. Contrary to the conditions existing in Europe, in America no marked invasions by the sea or extensive depressions of continental land are characteristic of Miocene time, though in special localities the Miocene sediments transgress the remnants of the Eocene.

Regarding temperature conditions Dr. Dall writes:

We may therefore conclude (1) that the temperature conditions governing the fauna of the Maryland Chesapeake were those of the temperate rather than the boreal or subtropical faunas of the present coast; and (2) that the temperature of the Chesapeake embayment was on the whole somewhat warmer than at present. This is what the genera represented also indicate. Between the several horizons of the Maryland Chesapeake there is but very slight indication of any temperature difference; so far as there is any, it points toward a progressive but slight cooling of the water from the Calvert to the St. Mary's; while the subsequent Pliocene was doubtless accompanied by a change in the opposite direction, a rise of temperature being indicated by the changes in the fauna.

H. S. W.

Preliminary Report on the Geology of the Arbuckle and Wichita Mountains, in Indian Territory and Oklahoma. By JOSEPH A. TAFF. With an Appendix on Reported Ore Deposits of the Wichita Mountains, by H. FOSTER BAIN. (Professional Paper No. 31, U. S. Geological Survey.)

This paper treats of the geology and physiography of the mountains named in the title. In both mountain regions there is a core of pre-Cambrian igneous rock. These rocks are much the same in both regions. The principal varieties in the Arbuckle Mountains are granite, quartz-monzonite, aplite, granite-porphyry, and diabase. In the Wichita Mountains gabbro is present, besides most of the above.

The lowest sedimentary rocks of the Arbuckle Mountain region are referred to the Middle Cambrian, and the Ordovician, Silurian, Devonian, Mississippian, Pennsylvanian, Permian, and Cretaceous systems are all represented. The successive formations are conformable up to the top of the Mississippian. There are unconformities between the Mississippian and the Pennsylvanian, between the Pennsylvanian and the Permian, and between the Lower and Upper Cretaceous. The rocks have been considerably deformed and displaced by folding and faulting.

In the Wichita Mountains the oldest sedimentary rocks are likewise referred to the Middle Cambrian. The other systems represented are the Ordovician and the Permian. The intervening Silurian, Devonian, and Carboniferous beds are supposed to be buried by the Red Beds. The structure of the Wichita Mountains is comparable to that of the Arbuckle Mountains; that is, the beds are deformed both by folding and faulting.

The physical history of the region is outlined as follows: The mid-Carboniferous (Mississippian?) rocks were uplifted and folded, resulting